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Effect of Host Age and Photoperiod on the Parasitism by *Trichogrammatoidea bactrae*

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Abstract: The experiment was conducted to determine the effect of host age and photoperiod on the parasitism of *Trichogrammatoidea bactrae* (Hymenoptera: Trichogrammatidae). Pink Bollworm (PBW, *Pectinophora gossypiella* (Lepidoptera: Gelechiidae) eggs were used as host. The host eggs of different ages (1, 2, 3, 4 and 5 days old) were exposed to two pairs of the parasitoid *(T. bactrae)* at two light/dark regimes (complete light & complete darkness) with constant 75% relative humidity and 28 °C temperature. It was observed that under the conditions of this test, maximum parasitization, > 90% by *T. bactrae*, was obtained when 1 or 2 days old host (PBW) eggs were held in complete light

Key Words: *Trichogrammatoidea bactrae, Pectinophora gossypiella*, parasitism, host age

Introduction

Trichogrammatoidea spp. are all egg parasitoids of economically important Lepidoptera (Hutchison *et al.*, 1990). Paul Walker in 1984 discovered *T. bactrae* from Biloea, Queensland, Australia from *Pectinophora scutigera* (Holdaway) (Gelechiidae, a micro lepidoptera related to Pink Bollworm) in cotton. *T. bactrae* is an easily reared PBW egg parasitoid (Hutchison *et al.*, 1990, Malik, 2000). *T. bactrae* proved itself a good biological agent of PBW in the laboratory (Malik, 2000). Nagaraja (1978) described *T. bactrae* collected from sugarcane and cotton crops in India. Hutchison *et al.* (1990), Naranjo (1993) and Malik (2000) studied the biology of the parasitoid. Host egg age (King, 1997), and photoperiod (Yeargan & Barney, 1996) play an important role in the parasitism and development of a parasite/predator in the field. *T. bactrae* may prove a good biological control agent against PBW in cotton (Nagaraja, 1978).

The study was designed to evaluate the effect of host *(P. gossypiella)* egg age and photoperiod on the parasitization rate by *T. bactrae*. PBW is a major pest of cotton in the world which causes >30% damage to the crop in Pakistan (Korejo *et al.*, 2000). The results of this study would help in the future IPM planing for cotton.

Materials and Methods

The experiment was conducted in the Department of Entomology, Plant Pathology and Weed science, New Mexico State University, Las Cruces, USA in the controlled environmental chambers (Atmar & Ellington, 1972).

The experiment was replicated eight times in a randomized complete block design with five different age classes of host eggs (1, 2, 3, 4 and 5 days old) and two light/dark regimes (complete light hours & Complete darkness) at constant 28 °C temperature and 75% RH, which were reported for the best fecundity of *T. bactrae* (Malik, 2000; Naranjo, 1993). At 28 °C temperature about 24 egg/female were obtained by *T. bactrae* (Malik, 2000).

About 100 PBW eggs were placed in the air tight (50 x 09 mm) petri dishes with two newly emerged pairs of *T. bactrae*. The pre-oviposition period of *T. bactrae* at 28 °C temperature is about half an hour (Malik, 2000). PBW and *T. bactrae* were obtained from the locally established colonies. A cotton swab dipped in 100% natural honey was placed in each petri dish as adult diet (Malik, 2000). The petri dishes were placed in the environmental chambers at constant 28°C temperature, 75% RH and two light/dark regimes. After every 23 hours the host eggs were replaced by the same age class till the death of the parasitoids and were allowed to develop at the same environmental conditions till the blackening of the vitelline membrane of the host eggs. Blackening of the vitelline membrane of the host (PBW) egg occurs at the on set of the pre-pupal stage (Hutchison *et al.*, 1990) which indicates the parasitization of thehost egg by *T. bactrae* (Malik, 2000). All black PBW eggs were counted for each treatment and analyzed by ANOVA (Analysis of Variance) through Statistical Analysis System, SAS, (SAS, 1990) for the effect of host age and photoperiod on parasitization rate by *T. bactrae*. A Least Significance Difference (LSD) Test was applied on significant interactions found by ANOVA.

Results and Discussion

Analysis of variance for the treatments showed that both treatments (host age and photoperiod) had significant interactions. The results showed that under the conditions of this test, The best parasitization rate (>90%) was obtained when 1 or 2 days old PBW eggs were exposed to the parasitoid in complete light hours (Table 2).

Table 1: [*1]Mean Number of Different Age Host (PBW) Eggs Parasitized by *T. bactrae*

Photoperiod	Host (PBW) Eggs Age (days)				
	1	2	3	4	5
Complete light hours	46 [*2]aB	44a [*3]aA	29 aC	20 aE	13 aF
complete dark hours	40 aB	40 aA	27 aC	18 aE	11 aF

[*1]Means are from eight replications. [*2]Lower case letters indicate significant differences down the column using the LSD test. [*3]Upper case letters indicate significant difference across the rows using the LSD test. LSD for photoperiod 1.34 and for host egg age 1.25 at 5% level of probability.

Table 2: [*1]Percent Parasitization By *T. bactrae* in Different Age Classes of Host (PBW) Eggs.

Photoperiod	Host (PBW) Eggs Age (days)				
	1	2	3	4	5
Complete light hours	95.81%	91.65%	60.40%	41.66%	27.07 %
complete dark hours	83.32%	83.32%	56.24%	37.49%	22.91 %

[*1]Percent Parasitization is calculated by considering the maximum fecundity (24 eggs/female) by using the data from Table 1.

The two tested photoperiods were also significantly different in the parasitization rate by *T. bactrae* (Table 1). King (1997) reported that exposure of host affects positively, the parasitization rate by the parasitoid. Lawson *et al.* (1997)

reported that parasitization rate is affected by the parasitoid release pattern. Small petri dishes (50 x 09 mm) were used in this experiment in which the parasitoid were in direct contact with the host eggs. Visual cues play an important role in host findings (Calvin *et al.*, 1997). In field where the conditions are mostly not ideal for a parasitoid the factor of light and host finding might have influence on parasitism by the parasitoid.

T. bactrae showed a good response of parasitization to the fresh host eggs than the old ones (Table 1). Similar response were observed by Somchoudhury & Dutt (1988) in case of *Trichogramma perkinsi* Girault (Hymenoptera: Trichogrammatidae) & *Trichogramma australicum* Girault (Hymenoptera: Trichogrammatidae) against different hosts like *Heliothis armigera* Hubner and *Chilo partellus* Swinhoe, Achaeajanata L. Calvin *et al*. (1997) observed *Trichogramma pretiosum* Riley (Hymenoptera: Trichogrammatidae) against *Diedre grandiosella* (Dyar) and King (1997) used *Spalangia cameroni* & *Muscidifurax raptor* (Hymenoptera: Pteromalidae) against *Musca domestica* L. (Diptera: Muscidae). Lawson *et al*. (1997) observed *Trichogramma platneri* Nagarkatti & *Trichogramma pretiosum* Riley (Hymenoptera: Trichogrammatidae) against *Choristoneura rosaceana* Harris (Lepidoptera: Tortricidae). All above authors have the same findings as of present work.

In view of the above discussion *T. bactrae* can be used as a good biological agent against PBW. Maximum parasitism by the parasitoid can be obtained by synchronizing the age of the host egg to the release time of the parasitoid.

References

Atmar, J. W. and J. J. Ellington, 1972. Construction and control characteristics of environmental simulation chambers. J. Econ. Entomol., 65: 401-404.

Calvin, D. D., J. E. Losey, M. C. Knapp and F. L. Poston, 1997. Oviposition and development of *Trichogramma pretiosum* (Hymenoptera: Trichogrammatidae) in three age classes of Southwestern Corn Borer eggs. Environ. Entomol. 26: 385-390.

Hutchison, W. D., M. Moratorio and J. M. Martin, 1990. Morphology and biology of *Trichogrammatoidea bactrae* (Hymenoptera: Trichogrammatidae), imported from Australia as a parasitoid of Pink Bollworm (Lepidoptera: Gelechiidae) eggs. Ann. Entomol. Soc. Am., 83: 46-54.

King, B. H., 1997. Effects of age and burial of house fly (Diptera: Muscidae) pupae on parasitism by *Spalangia cameroni* and *Muscidifurax raptor* (Hymenoptera: Pteromalidae). Environ. Entomol., 26: 410-415.

Korejo, A. K., A. W. Soomro, G. H. Mallah, A. A. Memon and M. Y. Solangi, 2000. Monitoring Pink Bollworm seasonal population through the use of Gossyplure. Pak. J. Bio. Sci., 3: 2119-2121.

Lawson, D. S., J. P. Nyrop and W. H. Reissig, 1997. Assays with commercially produced *Trichogramma* (Hymenoptera:Trichogrammatidae) to determine suitability for Obliquebanded Leafroller (Lepidoptera: Tortricidae) control. Environ. Entomol., 26: 684-693.

Malik, F. M., 2000. Life table studies of *Trichogrammatoidea bactrae*, Hymenoptera: Trichogrammatidae, an effective biological agent of Pin k Bollworm (*Pectinophora gossypiella* Lepidoptera: Gelechiidae) of cotton (Gossypium spp.). Pak. J. Bio. Sci., 3: 2106-2108.

Nagaraja, H., 1978. Studies on *Trichogrammatoidea* (Hymenoptera: Trichogrammatidae). Oriental Insects, 2 489-530.

Naranjo, S. E., 1993. Life history of *Trichogrammatoidea bactrae* (Hymenoptera: Trichogrammatidae), an egg parasitoid of Pink Bollworm (Lepidoptera: Gelechiidae) with emphasis on performance at high temperatures. Environ. Entomol., 22: 1051-1059.

Somchoudhury, A. K. and N. Dutt, 1988. Influence of hosts and hostages on the bionomics of *Trichogramma perkinsi* Girault and *Trichogramma australicum* Girault. Indian J. Ent., 50: 374-379.

SAS Institute Inc., 1990. SAS User Guide: Statistics, Cary, North Carolina: SAS Institute Inc., USA.

Yeargan, K. V. and W. B. Barney, 1996. Photoperiodic induction of reproductive diapause in the predators *Nabis americoferus* and *Nabis roseipennis* (Heteroptera: Nabidae). Ann. Entomol. Soc. Am., 89: 70-74.